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AUTHOR Cascio, Wayne F.; Silbey, Val
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ABSTRACT

Psychometric evaluations of the assessment center method of personnel selection have consistently shown positive results. However, this approach ignores certain external parameters (e.g., selection ratio, cost of the procedure) which largely determine the overall utility of a selection device. Moreover, the psychometric evaluation approach ignores the systemic nature of the selection process. Utility theory attempts to overcome these deficiencies by placing primary emphasis on the outcomes of prediction, rather than on measurement and prediction per se. The utility of the assessment center was evaluated by means of the Brogden-Cronbach-Gleser continuous variable utility model. After specifying several cost assumptions, six parameters were varied systematically: the validity and cost of the assessment center; the validity of the ordinary selection procedure; the selection ratio; the standard deviation of the criterion; and the number of assessment centers. The largest impacts on assessment center payoff were exerted by the size of the criterion standard deviation, the selection ratio, and the difference in validity between the assessment center and the ordinary selection procedure. Even assessment centers with validities as low as .10 still showed positive gains in utility over random selection. (Author/MH)

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The Utility of the Assessment Center as a Selection Device

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Wayne F. Cascio and Val Silbey

Florida International University

School of Business and Organizational Sciences

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Running head: Assessment Center Utility

The Utility of the Assessment Center as a Selection Device

Ever since the pioneering studies by Bray and his associates at AT&T in the 1950s (Bray, 1964), the assessment center approach to personnel selection has been an extremely popular technique. Since the early 1960s over 200,000 people worldwide have participated in assessment centers, and as of 1977 more than 1,000 business, government, and nonprofit organizations were using the assessment center method to improve the accuracy of their selection decisions (Development Dimensions, 1977). The attractiveness of the method for practitioners and professionals alike is not surprising, for it is firmly rooted in sound psychometric principles. By using multiple assessment techniques, by standardizing methods of making inferences from such techniques, and by pooling the judgments of multiple assessors in rating each candidate's behavior, it is felt that the likelihood of successfully predicting future performance is enhanced considerably (Cronbach, 1960; Taft, 1959).

Subsequent evaluative research has convincingly demonstrated the psychometric efficacy of the method. Interrater reliabilities of .60 to .99 (Bray & Grant, 1966; Dicken & Black, 1965; Greenwood & McNamara, 1967; Schmitt, 1977), and test-retest reliabilities (one month interval) of .77 (men), .70 (women), .68 (blacks), and .73 (whites) (Moses, 1973) have been reported.

Reviews of the predictive validity of assessment center ratings and subsequent job performance have also consistently been positive (Bray & Grant, 1966; Bray, Campbell, & Grant, 1974; Byham, 1970; Cohen, Moses, & Byham, 1974; Dunnette, 1971; Huck, 1973; Howard, 1974; Mitchell, 1975). Assessment centers <u>do</u> predict future performance, and they do it well, with predictive validities in the .50s and .60s not uncommon. Studies in small companies and in companies using

externally developed assessment procedures (e.g., Worbois, 1975) have relied heavily on synthetic validation (Thornton, Note 1). Their approach has been to analyze the job, identify the major ability dimensions, and then select assessment techniques to measure these requirements. Worbois (1975) has demonstrated that such an approach has merit; the median predictive validity for 12 assessment variables and supervisory ratings of performance in his study was .39. The selection fairness of the assessment center method for minority and female applicants has likewise been documented (Huck, 1974, Huck & Bray, 1976; Moses, 1973; Moses & Wall, 1975).

In short, the assessment center has easily met the psychometric requirements of the classical validity approach to selection. Total emphasis has been placed on measurement and prediction, and the primary objective has been to maximize the correlation (simple or multiple) between predicted and actual criterion scores.

This approach has been sharply criticized, however, for it ignores certain external parameters of the situation which largely determine the overall value or utility of a selection device. Both Brogden (1946; 1949) and Cronbach and Gleser (1965) pointed out that utility depends not only on validity, but also upon the selection ratio (the proportion of applicants selected), the standard deviation of criterion scores (which indicates both the magnitude and practical significance of individual differences in payoff), and the cost of the selection procedure. Since the standard deviation of criterion scores is constant for any one treatment, utility is properly regarded as a linear function of validity, and this linear relation holds at all selection ratios.

An additional shortcoming of the classical validity approach should also be noted. By focusing only on selection the classical validity approach neglects to consider the implications of selection decisions for the rest of the personnel

system. Several authors (Dudek, 1963; Dunnette, 1962; Wallace, 1965; Uhlaner, Note 2) have noted that an optimal selection strategy may not be optimal for other personnel functions such as recruiting and training. Factors such as the loss resulting from selection error and the organization's ability to evaluate success must also be considered. When attention is focused solely on selection, to the exclusion of other related functions, serious suboptimization of the entire personnel system can result. In short, any selection procedure must be evaluated in terms of its total benefits to the organization.

Decision theory, a more recent approach to selection, attempts to overcome these deficiencies. Cronbach and Gleser (1965), in the most rigorous treatment of decision theory to date, have noted that tests and other predictive devices are useful to the extent that they help make decisions. Decision theory acknowledges the importance of psychometric criteria in evaluating measurement and prediction, but in addition recognizes that the outcomes of prediction are of primary importance to individuals and organizations in our society. These outcomes must therefore be evaluated in terms of their consequences for individuals and organizations - i.e., in terms of their utility.

Utility analysis, in brief, is the determination of expected institutional gain ($+ U_i$) or loss ($- U_i$) anticipated to result from various courses of action (outcomes). When faced with a choice among alternative decision strategies, the strategy to be used is the one that maximizes the expected utility for the organization across all possible outcomes (Wiggins, 1973). A prior task, of course, is to estimate the utilities associated with various outcomes. This has traditionally been the "Achilles heel" of decision theory (Cronbach & Gleser, 1965), but the problem is less acute in business settings. Although extremely difficult (cf., Roche, 1965, pp. 254-267) institutional gains and losses may be estimated by relatively objective cost-accounting procedures, that is, in dollar terms.

No study has yet been done which evaluates the utility of the assessment center as a selection device, despite the fact that several people have called for it (Campbell, Dunnette, Lawler, & Weick, 1970; Howard, 1974). In one respect this is understandable, since the kinds of data required for such an analysis are not readily available in most organizations. Regardless of how many validity studies are conducted, however, the overall worth of the assessment center as a selection device in a particular organization or across organizations can not definitively be established in the absence of utility analyses. The objective of this article is to use illustrative examples to make the utility model a more meaningful tool for those who must interpret the data on the assessment center method. The utility analysis was accomplished by means of the Brogden-Cronbach-Gleser continuous variable utility model.

Six parameters were varied systematically: the validity and cost of the assessment center, the validity of the ordinary selection procedure, the selection ratio, the standard deviation of the criterion in dollars and the number of assessment centers. The payoff of the assessment center was then compared to an ordinary selection procedure and to random selection. By expressly including the estimated costs of recruiting, inducting, selecting, and training a sufficient number of persons to meet a specified quota of personnel, this systemic selection model enables decision makers to evaluate the cost consequences of alternative selection strategies.

Method

The core of the assessment center utility analysis was the following equation (Cronbach & Gleser, 1965, p. 308), which represents the net gain over random selection from testing N persons in programs of fixed treatment selection and placement:

$$\Delta \mu = N\sigma_e r_{ye} \xi(Y') - NC_y \qquad (1)$$

where:

$\Delta \mu$ = total gain in utility from use of the procedure

N = number of applicants

δ_e = the standard deviation of criterion in dollars

r_{ye} = the correlation between the selection procedure (Y) and the dollar scale evaluated outcomes (e) - the validity coefficient.

$\xi(Y')$ = the ordinate at the cutting score on the test (test scores are assumed to be distributed normally)

C_y = the cost of putting one person through the selection procedure.

Input and Cost Assumptions

The utility model was applied to a second level manager selection and placement process of a hypothetical firm. Since values for both cost and benefit parameters can be expected to vary considerably from firm to firm, a representative range of values was used to calculate the outcomes. The impact of each parameter was determined by holding all other parameters constant while one parameter was varied.

The problem definition assumed:

. selection for promotion from first to second level management

. promotion from within is company policy

. fixed quota of 50 managers

. half of all candidates from out of town

Costs for the selection and placement process include the cost of recruitment, induction and processing, training, and the cost of the selection procedure itself (either ordinary selection or selection by assessment center). Only the cost

of the selection procedure differs when ordinary selection (or random selection) is compared to the assessment center procedure. However, to illustrate the systemic nature of the selection process, all costs are included in the analysis. Cost and other assumptions are described more fully below.

Recruitment costs consist of $100 for in-house advertising and $200 for each of the out of town candidates. Expenses for out of towners would include airfare ($150 per person) and hotel ($50 per person for two nights) expenses. The number of persons recruited was determined by dividing the quota for selection (50) by the selection ratio. For example, when the selection ratio is .5, then 100 persons would have to be recruited to meet the quota. Hence recruitment costs are determined by the selection ratio parameter. When the selection ratio was allowed to vary, model values ranged from .1 to .9 in steps of .1. When other parameters were varied, the selection ratio was set at .5. This value was chosen since in a typical assessment center only about half of those assessed are rated "acceptable" (Bray & Campbell, 1968).

The cost of induction and processing was assumed to be minimal ($10 per candidate), since all candidates are current employees. The only expenses incurred would be minor clerical and paperwork costs. This cost element was held constant throughout the analysis, and its total changed only as the number of candidates changed.

Training costs were assumed to be $450 per person selected. Although assessment centers are often combined with training for all candidates (Byham, 1971), since this is not normally the case for other selection procedures, training costs were applied only to the selected people for the sake of consistency.

Training was assumed to occur locally, on company premises, and its start-up costs were assumed to have been amortized already. The cost of supplies

for each trainee was estimated at $50. The training program lasted three days and costs were incurred for each second level manager's salary ($90 per day), for hotel and food for two nights and three days ($100), and for facilities overhead ($10 per person per day). Therefore the training cost was $450 per person selected. Since a fixed quota of 50 managers was assumed, the total training cost for all selected persons would be $22,500.

The cost of the selection procedure is different for ordinary selection and for the assessment center. The ordinary selection procedure was two days in length and involved a series of three interviews with third level management. It was assumed that the three interviews cost $100 (management time, write-ups, clerical work, etc.), that each candidates' salary was $75 per day, and that food costs amounted to $40. (We assumed that candidates were taken out to eat and that costs consisted of two lunches at $5 for each of two persons and a dinner at $10 for each of two persons). Therefore the overall cost of the ordinary selection procedure was estimated at $290 per candidate.

The validity of the ordinary selection procedure was one of the parameters varied in the model. When the validity of ordinary selection was varied, it ranged from .05 to .95 in steps of .05. A validity of .25 for the ordinary selection procedure (i.e., multiple interviews) was assumed when other parameters were varied. Admittedly .25 is a rough estimate, but since the validity of the interview seems to vary widely across studies (Mayfield, 1964; McMurray, 1947; Rundquist, 1947, Trankell, 1959; Ulrich & Trumbo, 1965; Wagner, 1949), .25 appears reasonable.

Assessment center costs fall into three categories:

. costs of establishing the assessment center

. costs of the assessors

. costs of the candidates (assessees).

The costs of establishing the assessment center included sending two company representatives to an assessment center training program (at $400 each plus $150 each in salaries) and $350 per day in consultant fees for six days. It was assumed that the consultant spent one day in planning, two days training assessors, and three days at the assessment center. The costs of establishing the assessment center therefore amounted to $3,200 ($1100 for the two company representatives + $2100 for the consultant).

A two-day assessment center was conducted on company premises. Each assessment center required six assessors (at $110 each per day), who spent two days assessing and one day in a final evaluation and wrap-up for a total of three days and $1,980. In addition the assessors incurred food expenses of $31 per person (three lunches at $5 each and two dinners at $8 each). Hence the assessor cost for each assessment center conducted was $2,166.

The cost of the candidates was comprised of salary, food, and materials costs. Salaries were assumed to be $75 per candidate per day, food expenses $18 (two lunches and one dinner), and materials $30 per candidate. The total candidate costs were therefore $198 per candidate.

The number of assessment centers that have to be conducted is determined by the assessor-to-assessee ratio and the number of candidates to be assessed. For the utility model a range of ratios from 1:1.5 to 1:2.5 was used. These values are realistic (Byham & Thornton, 1970). Therefore each assessment center evaluated from 9 to 15 candidates per session. When other parameters were being varied, the number of candidates per assessment center was assumed to be approximately 12 (Byham, 1971). For example, with 100 candidates, eight assessment centers (four with 12 and four with 13 candidates) would be required.

The total per candidate cost of the assessment center cannot be calculated beforehand, since that is determined by the number of assessment centers to be

conducted. Instead, per candidate costs are calculated by spreading the costs of the assessment center procedure (start-up costs of $3200, assessor costs of $2166 times the number of assessment centers, and candidate costs of $198 times the number of candidates) over all of the candidates in a particular run of the utility model.

Regardless of what other parameters were being varied, the validity of the assessment center always varied from .05 to .95. However, as a focal point for comparisons, a validity of .35 was used. Dodd (Note 3) reported that the validities of 11 assessment center studies conducted at IBM ranged from .05 to .63 with a median value of .35. Most studies in the literature yield validities within this range (Cohen, Moses, & Byham, 1974).

For benefit calculations, the mean and standard deviation of the criterion distribution were determined as follows.[1] A panel of four third level managers with line responsibility for sales in a large food and beverage firm estimated the total yearly dollar value of sales to the company for second level managers twice: (1) for those at the 50th percentile; and (2) for those at the 85th percentile. Both groups had been selected without the aid of the assessment center. Since the dollar value of total yearly sales was approximately normally distributed, the difference (2) - (1) was a reasonable estimate of the criterion standard deviation for second level managers. Average yearly dollar values for the second level managers were about $30,000, with a standard deviation of approximately $9,500 in this firm.

This figure provides an estimate of each second level manager's yearly value of sales to the company. For purposes of the model, we assumed that all second level managers made approximately equal contributions to the firm. Admittedly this is a questionable assumption, and for this reason a range of criterion standard deviations was examined.

However, this figure is pertinent for one year only. Assuming that the average tenure of second level managers is five years and that the average stability of performance was .7 across years, then the criterion standard deviation (SDe) for a five year period can be calculated using the formula for the variance of a sum[2] (Guilford, 1965, p. 542):

$$SD_e = \sqrt{5(9{,}500^2) + 0.7(20)(9{,}500)(9{,}500)}$$

$$SD_e = \$41{,}409.54$$

It should be emphasized, however, that the mean and standard deviation of criterion performance, if estimated in dollar units, are heavily dependent on numerous factors such as the dollar value of each unit sold, the volume of units sold, and the organizational characteristics of the firm in question. Hence these values can be expected to vary considerably, even for different jobs in the same firm. For this reason a range of σ_e values varying from \$1,000 in the first year to \$20,000 in the first year in steps of \$1,000 was examined. These σ_e values center about the \$9,500 estimate that was used as a constant when other parameters were varied.

Output Explanation

An example of assessment center utility analysis output is presented in Table 1.

Insert Table 1 about here

In this example there is a quota of 50 successful managers, the selection ratio is .5, and therefore 100 persons must be recruited. Per candidate costs are as follows: \$101 (recruitment), \$10 (induction and processing), \$290 (ordinary selection), \$403.28 (assessment center), and \$450 (training). The standard deviation of the criterion distribution is \$9,500, in the first year, and

$41,409.54 over the five year period. The validity of the ordinary selection procedure is .25. Separate utility analyses are presented for the ordinary selection procedure and the assessment center.

The column labeled "Incremental Gain" represents the product of $N_J r_{ye} \bar{z}(Y')$ the left-hand term in Equation 1, the general utility equation. In this expression $\sigma_e r_{ye}$ is the slope of the payoff function relating expected payoff to performance on the selection measure. As can be seen, an increase in validity leads to an increase in slope, but slope also depends on the dispersion of criterion scores, a fact we shall discuss further in a following section.

The column labeled "Total Cost" represents the product of NC_y the right-hand term in Equation 1, and the column labeled "Gain in Utility" represents the difference between incremental gain and total cost. It is the net gain over random selection. In the example shown in Table 1, the total cost of selecting 50 managers using the ordinary selection procedure represents a savings of $350,356.62 over random selection, given our assumptions.

In the assessment center utility analysis a range of validities (varying from .05 to .95 in steps of .05) is examined. At each validity we compute the incremental gain, the total cost of the assessment center procedure, and the gain in utility. The gain in utility (over random selection) by means of the assessment center is then compared to the gain in utility using the ordinary selection procedure. The difference between these values represents the net assessment center payoff, in dollars, over the ordinary selection procedure. We have shown this both for the group as a whole ("Total A.C. Payoff") and on a per selectee basis ("Per Selectee A.C. Payoff").

As can be seen in Table 1, the per selectee assessment center payoff is always negative, as long as the validity of the assessment center is lower than that of the ordinary selection procedure (.25). When the validity of the two

procedures is equal (.25) the per selectee assessment center payoff is - $226.56, which represents the additional per selectee cost of the assessment center over the ordinary procedure. At all validities greater than .25 the assessment center payoff is positive, although even with a validity of .05 the gain in the utility of the assessment center over random selection is still $8,663.33, representing a net savings of about $173 per selectee.

Results and Discussion

In presenting our results, we will consider each parameter separately. The impact of each parameter is evaluated in terms of assessment center payoffs per selectee.[3] Payoffs refer to the dollar amount of incremental gain (or loss if negative) accruing to a firm that uses the assessment center instead of the ordinary selection procedure.

The utility analysis output discussed earlier (e.f. Table 1) serves as the basis for all calculations. The results are organized in ascending order of relative effects (percent change in assessment center payoff divided by percent change in parameter). A summary of the parameters and their relative effects is shown in Table 2.

Insert Table 2 about here

Effect of Variations in the Number of Assessment Centers

The number of assessment centers was varied from eleven to seven, giving assessor: assessee ratios between 1:1.5 to 1:2.5 and payoffs that ranged from $2947 to $3120. Since the comparison value is eight assessment centers with a payoff of $3077, a 50 percent change in the number of assessment centers resulted in a 5.6 percent change in the payoff. Since these changes generate a payoff/parameter change ratio of .11, a change in the number of assessment centers is insignificant.

Effect of Variations in the Cost of the Assessment Center

Cost of the assessment center was varied by adding up to $2000 in per candidate costs. Hence, per candidate costs ranged from $403 to $2403, with corresponding payoffs per selectee ranging from $3077 to - $922.91. Here a 496 percent change in the parameter value resulted in a 130 percent change in payoff. Since the payoff/parameter change ratio is .26, the effect of changes in the cost of the assessment center is also insignificant.

Effect of Variations in the Criterion Standard Deviation

Figure 1 shows the effect of changes in the criterion standard deviation on the per selectee assessment center payoff. The lines from top to bottom represent five-year criterion standard deviations of $87,178, $65,383, $43,589, $21,794, and $4,359, respectively. (These values correspond to first-year standard deviations of $20,000, $15,000, $10,000, $5,000 and $1,000).

All lines radiate from a point located at an assessment center validity of .25 and a per selectee assessment center payoff of -$226.56. At this point the validity of the assessment center is equal to the validity of the ordinary selection procedure used in the utility analysis (.25) and the assessment center payoff is equal to the difference in cost between the assessment center and the ordinary selection procedure.

Insert Figure 1 about here

As can be seen from Figure 1, the larger the criterion standard deviation the larger the payoff of the assessment center (assuming, of course, that assessment center validity exceeds the validity of the ordinary selection procedure).

We can also look at the data from a transposed perspective. Holding assessment center validities constant, what is the impact of varying the five-year criterion standard deviations? These results are shown in Table 3.

Insert Table 3 about here

These regression lines mean that at a five-year criterion standard deviation of zero, the per selectee assessment center payoff would be -$226.56 for all assessment center validities. For all five-year criterion standard deviations greater than zero, if the assessment center's validity is less than the ordinary selection procedure's validity, then increases in criterion standard deviation contribute to a loss in payoff if the assessment center is used. For an assessment center validity of .05 (note that the ordinary selection procedure's validity is .25), each dollar increase in five-year criterion standard deviation subtracts $.16 from the per selectee assessment center payoff. Hence, when σ_e is $43,589 the opportunity loss[4] per selectee is almost $7000.

The reverse is true when assessment center validities are greater than ordinary selection procedure validities. In this case each increase in five-year criterion standard deviation increases the payoff of the assessment center. For example, with an assessment center validity of .35, each dollar increase in five-year criterion standard deviation adds $.08 to the per selectee assessment center payoff.

The decisive impact of changes in the criterion standard deviation on the per selectee assessment center payoff is indicated by a payoff/parameter change ratio of 1.07. The magnitude of this index underscores the importance of obtaining reliable and accurate criterion data.

Effect of Variations in Selection Ratio

In the utility analysis, selection ratio was varied from .1 to .9. This resulted in a per selectee assessment center payoff that varied from $6300 to $620. When compared to focal values of .5 for selection ratio and $3077 for

assessment center payoff, a 160 percent change in selection ratio resulted in a 185 percent change in payoff. Thus the payoff/parameter change ratio was 1.15.

Figure 2 shows the effect of changes in the selection ratio on per selectee assessment center payoffs. From top to bottom, the lines represent selection ratios of .1, .3, .5, .7 and .9, respectively.

Insert Figure 2 about here

As can be seen, smaller selection ratios have a larger impact on the per selectee assessment center payoff. This is also demonstrated in Table 4, which shows the intercept and slope of the selection ratios plotted in Figure 2.

Insert Table 4 about here

Table 4 also shows two other variables that affect the payoff - the number of candidates and the number of assessment centers conducted. As the number of candidates increases with lower selection ratios (to meet the fixed quota of 50 selectees), the number of assessment centers also increases. Due to the cost structure, this variation in the number of assessment centers results in discontinuities in per selectee payoffs. The discontinuities are apparent in Figure 2, since all the lines do not cross at the same point.

The varying size of the applicant pool has another effect - it changes the selection ratio at which the greatest payoff is achieved. Payoff is greatest at a selection ratio of .5 (due to the nature of the normal curve) if the applicant pool is held constant. With a constant applicant pool, as the selection ratio moves from .1 to .5, total utility increases (if the assessment center validity is greater than .25). But with a varying number of candidates such is not the case. Total utility decreases as the selection ratio increases from .1 to .9.

Variations in the size of the applicant pool, as selection ratio varies means that different selection situations are being compared. When comparing across different applicant pools, it is quite possible for total utility to be greater at, say, a selection ratio of .2 in one applicant pool than at a selection ratio of .5 in another. In our case this conclusion held for all assessment center validities greater than .1. Such systemic variation must be expected in an organizational setting.

Effect of Variations in Ordinary Selection Validity and Assessment Center Validity

Since the impact on payoff of increasing the ordinary selection procedure's validity is equivalent to lowering the assessment center's validity, the discussion of these changes has been combined. Ordinary selection procedure validities were varied from .05 to .95, which gives a percentage change of 360 percent when compared to assumed ordinary selection validity of .25. These changes, resulted in assessment center payoffs (at an assessment center validity of .35) ranging from $9684 to -$20,048, or a 966 percent change. Hence the payoff/parameter change ratio was 2.69. Since the focal assessment center validity was .35 (as compared to .25 for the ordinary selection procedure), the same range in assessment center validities corresponds to a 257 percent change and a payoff/parameter change ratio of 3.76.

In both cases the slope of the regression line of 33036.53 indicates that for every change of .01 in validity, the payoff would change by $330.37. The only difference is that when the change is an increase in validity for the ordinary selection procedure, then assessment center payoff decreases and when the change is an increase in assessment center validity, than the assessment center payoff increases.

Conclusions

One of the most significant impacts on assessment center payoff appears to come from the size of the criterion standard deviation. Here is where the assessment center can potentially make a major contribution to a selection program - when individual differences in criterion performance are large and significant - yet the classical validity approach to selection totally ignores this fact, as have previous research-oriented evaluations of the assessment center. In fact, even when the standard deviation of the criterion distribution is as low as $5,000 in the first year assessment centers with validities of only .1 still show positive gains in utility over random selection. It should also be noted, however, that since the ordinary selection procedure is cheaper it demonstrates positive utility over random selection at even lower criterion standard deviations. In general, since gains in utility depend on the product $r_{ye}\sigma_e$ and a large σ_e indicates that individual differences on the criterion have large practical importance, predictors with low validity may still yield considerable benefit if σ_e is large (Brogden, 1949). Conversely, procedures with high validity may be less useful if individual differences in payoff are small. These results demonstrate that validities have to be considered, not in isolation, but in comparison to other parameters.

The cost of the assessment center played a relatively minor role in determining payoffs. At first glance this may seem surprising, but when one stops to consider that for many jobs the standard deviation of criterion outcomes can be as high as $15,000 to $20,000 in the first year (and $65,000 to $87,000 over a five year period), the increased cost of a more highly valid selection procedure may be a small price to pay for the long-term payoff which the procedure may provide.

One final point deserves mention. In this study we have made many assumptions and estimates - about the costs of recruitment, induction and processing, selection

(ordinary and assessment center), and training; about the average tenure of second level managers; about the average stability of performance across years; and about the validities (computed against dollar payoffs) of selection procedures. The fact that error is no doubt present in all of these estimates emphasizes the fact that "the dollar payoff from an employee is an elusive concept" (Cronbach, 1965, p. 266). It also illustrates the need for a closer liaison between personnel psychologists and cost accountants. Roche (1965) has shown that by doing so the dollar criterion can be determined even where persons in a job classification are working on different tasks, where the tasks assigned a person differ from week to week, and where the tasks vary in profitability. Alternatively one might ask, "How long can we go on <u>without</u> attacking the problem from an interdisciplinary perspective?"

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Footnotes

Requests for reprints should be sent to Wayne F. Cascio, Florida International University, School of Business and Organizational Sciences, Tamiami Trail, Miami, Florida 33199.

[1]The authors would like to thank Frank Schmidt for suggesting this method of estimating the criterion standard deviation.

[2]This formula is:

$$\delta^2(x_1+x_2+\ldots x_n) = \delta^2{}_1 + \delta^2{}_2 + \ldots \delta^2{}_n + 2r_{12}\delta_1\delta_2 + 2r_{13}\delta_1\delta_3 + \ldots + 2r_{1n}\delta_1\delta_n + \ldots + 2r_{(n-1)n}\,\delta_{(n-1)}\,\delta_n$$

[3]Complete documentation of the results is contained in a working paper by the authors (Note 4).

[4]The opportunity loss for selecting action a_i (here, the assessment center) when state of nature s_j is in effect (i.e., the ordinary selection procedure has a higher validity) is the difference between the maximum profit that could be realized if s_j occurs and the profit obtained by selecting a_i.

Table 1

Sample Utility Analysis Output

```
**********************************
*                                *
** U T I L I T Y   A N A L Y S I S **
*                                *
**********************************

          CUCTA FOR SELECTION:   50
              SELECTION RATIO:  .50
        CRDINATE AT SEL. RATIO:  .399
            NUMBER RECRUITED:    100
  NUMBER OF ASSESSMENT CTRS:      8
```

TYPE OF COST	PER CANDIDATE	TOTAL
RECRUITMENT	101.00	10100.00
PROC & INDUC.	10.00	1000.00
ORD. SELECTION	290.00	29000.00
ASSESSMENT CTR	403.28	40328.00
TRAINING	450.00	22500.00

	1ST YEAR	5 YEAR TOTAL
CRITERION S.D.	9500.00	41409.54

ORDINARY SELECTION

VALIDITY	INCREMENTAL GAIN	TOTAL COST	GAIN IN UTILITY
.25	412956.62	62600.00	350356.62

ASSESSMENT CENTER

VALIDITY	INCREMENTAL GAIN	TOTAL COST	GAIN IN UTILITY	PER SELECTEE A.C. PAYOFF	TOTAL A.C. PAYOFF
.05	82591.33	73928.00	8663.33	-6833.87	-341693.30
.10	165182.65	73928.00	91254.65	-5182.04	-259101.98
.15	247773.97	73928.00	173845.97	-3530.21	-176510.65
.20	330365.30	73928.00	256437.30	-1878.39	-93919.32
.25	412956.62	73928.00	339028.62	-226.56	-11328.00
.30	495547.95	73928.00	421619.95	1425.27	71263.32
.35	578139.27	73928.00	504211.27	3077.09	153854.65
.40	660730.60	73928.00	586802.60	4728.92	236445.98
.45	743321.92	73928.00	669393.92	6380.75	319037.30
.50	825913.25	73928.00	751985.25	8032.57	401628.62
.55	908504.56	73928.00	834576.56	9684.40	484219.94
.60	991095.89	73928.00	917167.89	11336.23	566811.27
.65	1073687.20	73928.00	999759.20	12988.05	649402.58
.70	1156278.55	73928.00	1082350.55	14639.88	731993.92
.75	1238869.86	73928.00	1164941.86	16291.70	814585.23
.80	1321461.20	73928.00	1247533.20	17943.53	897176.58
.85	1404052.52	73928.00	1330124.52	19595.36	979767.89
.90	1486643.84	73928.00	1412715.84	21247.18	1062359.22
.95	1569235.17	73928.00	1495307.17	22899.01	1144950.55

Table 2

Relative Effects of Changes in

Utility Model Parameters

Parameter	Payoff/Parameter Change Ratio
Number of Assessment Centers	.11
Cost of Assessment Center	.26
Criterion Standard Deviation	1.07
Selection Ratio	1.15
Validity of Ordinary Selection	2.68
Validity of Assessment Center	3.76

Table 3

Regression of Assessment Center Payoff on Five-year Criterion Standard Deviation Holding Assessment Center Validity Constant

Assessment Center Validity	Intercept(A)	Slope(B)
.05	-226.56	-.16
.20	-226.56	-.04
.35	-226.56	.08
.50	-226.56	.20
.95	-226.56	.56

Table 4

Regression of Assessment Center Payoff

on Assessment Center Validity Holding

Selection Ratio Constant

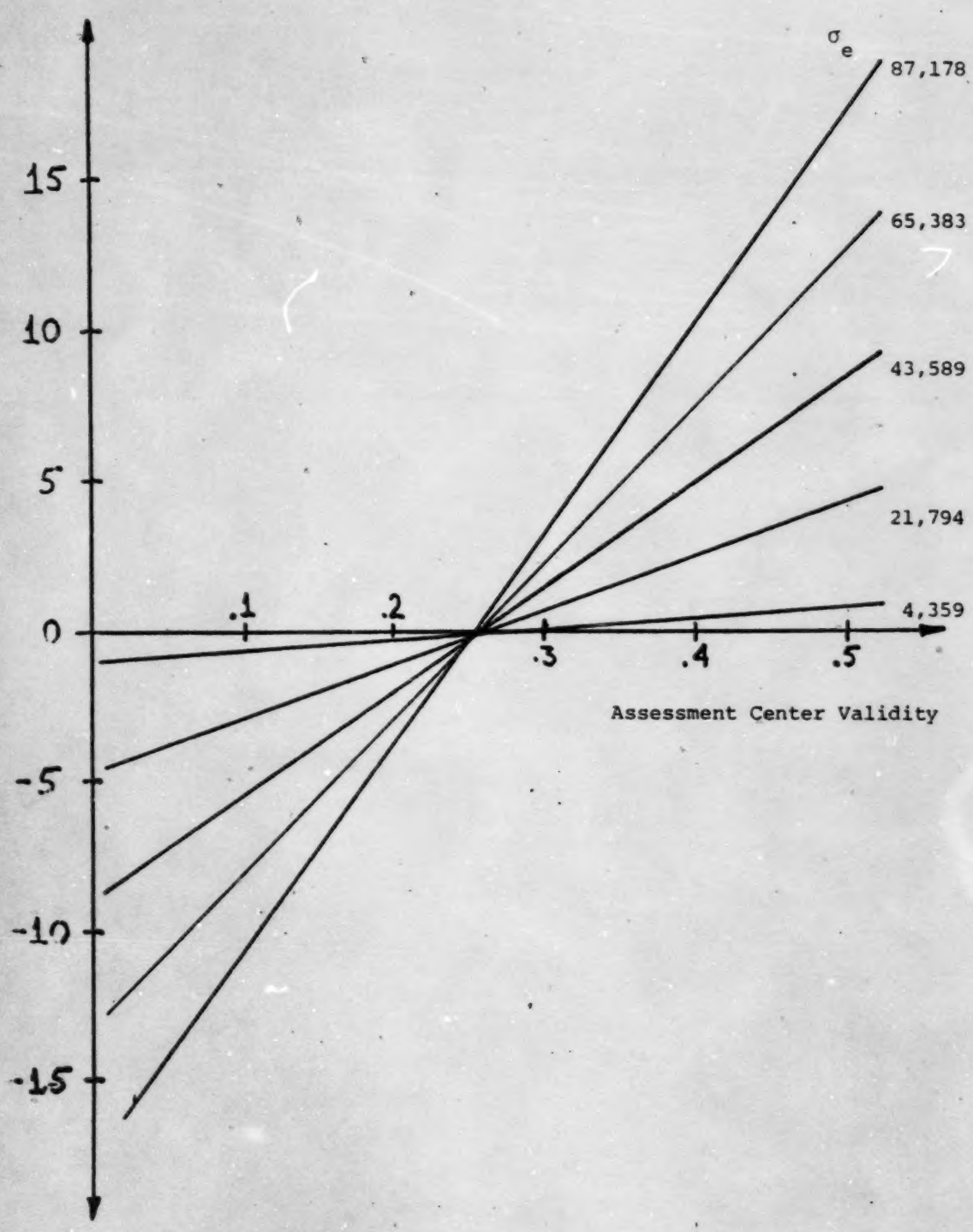
Selection Ratio	Number of Candidates	Number of Assessment Centers	Regression Coefficients (as Assessment Center Validity Changes) Intercept (A)	Slope (B)
.1	500	42	-19,121.53	72,632.33
.3	166	14	-12,318.90	47,815.43
.5	100	8	- 8,485.70	33,036.53
.7	71	6	- 5,306.08	20,451.18
.9	55	5	- 2,129.79	8,271.54

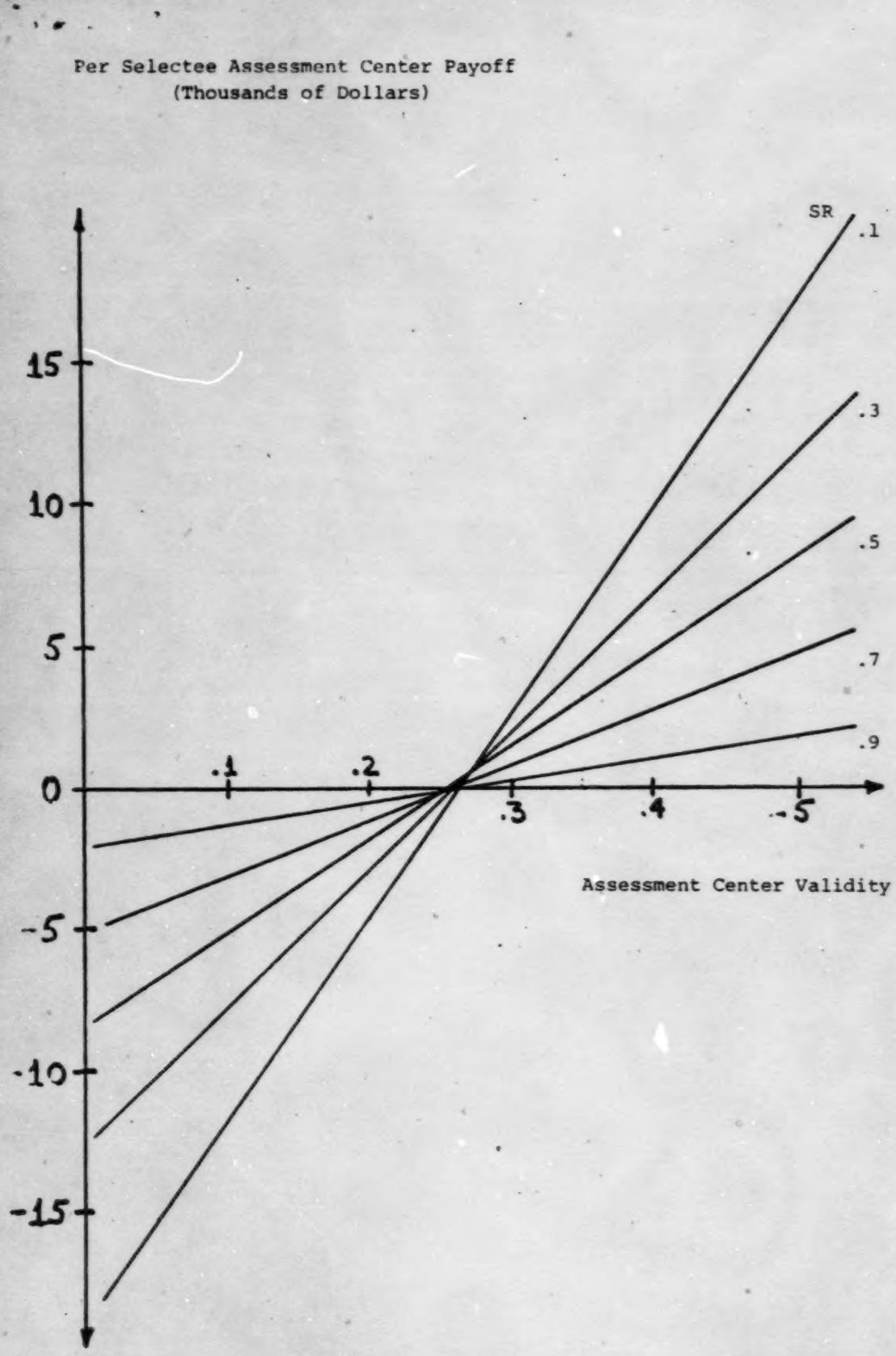
Figure Captions

Figure 1. Effect of variations in criterion standard deviation and assessment center validity on assessment center payoff.

Figure 2. Effect of variations in selection ratio and assessment center validity on assessment center payoff.

Per Selectee Assessment Center Payoff
(Thousands of Dollars)




Per Selectee Assessment Center Payoff
(Thousands of Dollars)
SR
.1
.3
.5
.7
.9
15
10
5
0
-5
-10
-15
.1
.2
.3
.4
.5
Assessment Center Validity